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# CATCHES OF DOWNSTREAM MIGRATING CHINOOK SALMON AND STEELHEAD TROUT IN BARGE TRAPS BELOW BROWNLEE DAM, 1959

Annual Report

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## Introduction

This program was initiated as a part of a cooperative project among the fisheries agencies of Oregon and Idaho, the Fish and Wildlife Service and Idaho Power Company in conformance with orders from the Federal Power Commission of August 26, 1958, relative to closure of the diversion tunnel at Brownlee Dam and filling of Brownlee Reservoir.

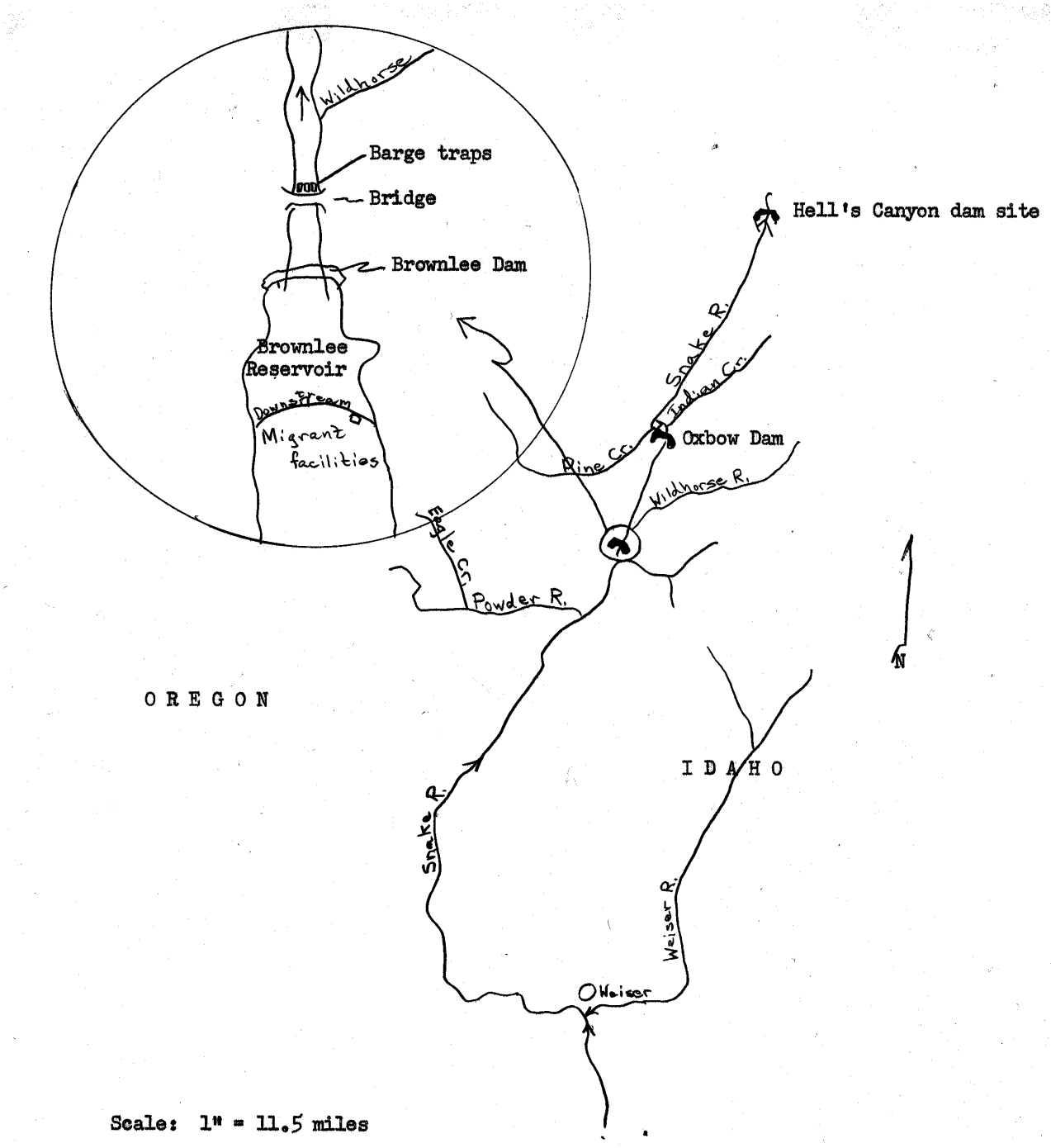
The primary purpose of the trapping was to determine if fish were passing the barrier net and the dam and proceeding downstream prior to completion of the downstream passage facilities (Figure 1). The need for extensive repairs to and changes in construction of the net during 1959-60 has made the continued operation of the barge traps necessary.

## Description of the barges and their operation

Three downstream migrant trapping barges were used during 1959, two of which were obtained from the Washington Department of Fisheries. The barges and their traps were fished across the Snake River below the Brownlee interstate bridge in water velocities varying from 3 to 9 feet per second. One barge was near each shore and one in the middle of the river. A full description of the barges and traps and fishing techniques employed is given in an earlier report (Bell, 1959).

The barges were fished in 24-hour shifts except where conditions made it impossible to check. them. Records were kept for each barge, showing catch, water velocity, water temperature, turbidity, weather, river depth at trap throat, and approximate location of the barge by its distance from the shore. Fork lengths in mm. were taken of all anadromous game fish caught and all species were recorded by numbers caught. All live game fish were released immediately after measuring.

Figure 1. Middle Snake River Area



## Findings and Discussion

### Chinook salmon downstream migration

Two periods of extremely large catches of downstream chinook migrants occurred during 1959 in the downstream migrant trapping barges below Brownlee Dam as shown in Tables 1, 2 and. 3. The first period of high catches occurred between July 15 and August 26 when an estimated 81,979 chinook passed the bridge below Brownlee. The highest daily catch during this period, 249 chinook salmon, was made on August 8. An estimated 12,896 chinook passed the trapping site on this day.

A possible explanation for this large surge of fish, which either passed through or under the barrier net, was the release of large quantities of water from the reservoir on July 20 and 22 as shown in Table 2. The purpose of this drawdown was for an experimental fuse plug test at the Oxbow cofferdam. On July 20, the daily mean water release at Brownlee was 18,558 c.f.s. with a mean daily spill of 7,627 c.f.s. Large hourly releases were made at different times of the day. The largest hourly release was made between 12:00 noon and 1:00 p.m. when 42,250 c.f.s. was discharged through the dam (Table 4). On July 22, the mean daily flow was 12,448 c.f.s. with a mean daily spill of 10,187 c.f.s. As on July 22, larger hourly releases were made. The end result of the sudden large drawdown was a marked temperature increase in the upper stratum of water in the reservoir adjacent to the dam which, along with increased water velocities in the reservoir, apparently caused salmon and steelhead to leave the reservoir--either going under the net or through holes in lower portions. On July 20, the water temperatures at various depths, taken at the Idaho Power Company barrier net during the morning, were: surface--74.9$^{o}$ , 10 feet--72.5$^{o}$ , 25 feet--70-7$^{o}$, 50 feet--69.7$^{o}$ F. On July 28, the week after the large sudden drawdown, the water temperatures were: surface--78.2$^{o}$, 10 feet--76.2$^{o}$, 25 feet--76.0$^{o}$ and 50 feet--73.9$^{o}$ F. One hundred-foot temperatures were about the same on both days--64.4 and 64.5 degrees F., respectively. Downstream migrations in May and June

Table 1. Total catches all species, on downstream migrant trapping barges, Brownlee dam, by species and month, January 1, 1959 - December 31, 1959

| Species | Jan | Feb | Mar | Apr | May | June | July | Aug | Sept | Oct | Nov | Dec | Total by Species | Per cent of total | Per cent Game fish | Per cent Res fish |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Chinook Salmon | 1 | | | 60 | 66 | 345 | 705 | 1,482 | 20 | 652 | 170 | 31 | 3,532 | 46.94 | 53.96 | |
| Steelhead Trout | 3 | | | | | 2 | 3 | 14 | | 11 | 1 | 2 | 36 | .48 | .55 | |
| Black Crappie | 1 | 103 | 443 | 24 | 31 | 120 | 31 | 79 | 178 | 241 | 148 | 5 | 1,404 | 18.66 | 21.45 | 40.12 |
| Black Bullhead | 20 | | 16 | 75 | 95 | 64 | 20 | 56 | 61 | 51 | 25 | 8 | 491 | 6.52 | 7.50 | 14.03 |
| Channel Catfish | 9 | 3 | 54 | 146 | 54 | 13 | 23 | 22 | 68 | 254 | 271 | 69 | 986 | 13.10 | 15.06 | 28.17 |
| Smallmouth Bass | | 4 | | 1 | 3 | 2 | 1 | | 6 | 6 | 10 | 15 | 48 | .64 | .73 | 1.37 |
| Largemouth Bass | | | | | | | | | | | 6 | | 6 | .08 | .09 | .17 |
| Yellow Perch | | | | | | | 1 | 1 | 1 | 2 | 2 | | 7 | .09 | .11 | .20 |
| Whitefish | | | | | | | 5 | | | 3 | | | 8 | .11 | .12 | .23 |
| Pumpkinseed | | | | | | | | | 1 | 3 | | | 4 | .05 | .06 | .12 |
| Bluegill | | | | | | | | | 11 | 3 | 6 | | 20 | .27 | .31 | .57 |
| Sturgeon | | | | | | | | | 1 | | 1 | | 2 | .03 | .03 | .06 |
| Eastern Brook | | | | | | | | | | 2 | | | 2 | .03 | .03 | .06 |
| Total Game Fish | 34 | 110 | 513 | 306 | 249 | 546 | 789 | 1,654 | 347 | 1,228 | 640 | 130 | 6,546 | | 100.00 | |
| | | | | | | | | | | | | Sub. | Total | 87.00 | | 85.10 |
| | | | | | | | | | | | | | | | Per cent non-game fish | |
| Lamprey* | 1 | 1 | 1 | 21 | 11 | 85 | 96 | 52 | 55 | 107 | 19 | 7 | 456 | 6.06 | 46.63 | |
| Carp | 6 | 2 | 7 | 7 | 2 | 35 | 8 | 12 | 16 | 49 | 7 | 2 | 153 | 2.03 | 15.64 | 4.37 |
| Redside Shiner | 1 | | | | | 1 | | 2 | 1 | | | | 5 | .07 | .50 | .14 |
| F.S. Sucker | | 1 | | | | 15 | 2 | 8 | 27 | 152 | 17 | | 222 | 2.95 | 22.70 | 6.34 |
| Squawfish | | | 2 | 4 | 5 | 1 | 1 | 3 | 1 | 2 | | 1 | 20 | .27 | 2.05 | .57 |
| Long Nosed Dace | | | | 5 | | 21 | 42 | 12 | 1 | 7 | 1 | | 89 | 1.18 | 9.10 | 2.54 |
| Chiselmouth | | | | | | 5 | | 1 | | 8 | 3 | 4 | 21 | .28 | 2.15 | .60 |
| Tadpole Madtom | | | | | | | | | 6 | 3 | 3 | | 12 | .16 | 1.23 | .34 |
| Total non-game fish | 8 | 4 | 10 | 37 | 18 | 163 | 1.19 | 90 | 107 | 328 | 50 | 14 | 978 | | 100.00 | |
| | | | | | | | | | | | | Sub. Total | | 13.00 | | 14.90 |
| Total all Spec. Fish | 42 | 114 | 523 | 343 | 267 | 709 | 938 | 1,744 | 454 | 1,556 | 690 | 144 | 7,524 | 100.00 | | 100.00 |

Table 2. Reservoir elevation, 24-hour net storage change and surface temperature, daily mean Brownlee water release, spillway discharge, total barge trap catches and total downstream facility catches, July 1 - November 30, 1959*:

| Date | Reservoir Elevation MSL (+2000) | Reservoir 24-hr net storage change A.F. | Reservoir surface water temp.°F. | Daily mean Brownlee water release | Daily mean Brownlee spillway discharge cfs | Total barge trap catches | | Total downstream migrant facility catches | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Chinook | Steelhead | Chinook | Steelhead |
| July | 76.22 | 0 | 70 | 12,446 | 3,271 | 1 | 0 | 476 | 134 |
| 2 | 76.22 | 0 | 71 | 10,040 | 1,165 | 2 | 0 | 533 | 24 |
| 3 | 76.36 | +12,772 | 73 | 9,366 | 0 | 2 | 0 | 515 | 27 |
| 4 | 76.61 | + 3,688 | 72.8 | 9,228 | 1,691 | 4 | 0 | 885 | 20 |
| 5 | 76.99 | + 5,601 | 71.9 | 13,889 | 7,021 | 8 | 0 | 294 | 7 |
| 6 | 76.98 | - 140 | 72 | 10,313 | 1,167 | 1 | 0 | 1,080 | 27 |
| 7 | 76.98 | 0 | 70.1 | 10,454 | 708 | 5 | 0 | 301 | 7 |
| 8 | 76.96 | - 279 | 71.6 | 10,496 | 833 | 7 | 0 | 353 | 5 |
| 9 | 77.00 | + 558 | 72.1 | 11,144 | 896 | 3 | 0 | 353 | 25 |
| 10 | 76.96 | - 1,395 | 72 | 10, 411 | 0 | 2 | 0 | 250 | 8 |
| 11 | 76.97 | + 977 | 73 | 9,971 | 1,388 | 3 | 0 | 171 | 5 |
| 12 | 76.98 | + 139 | 73 | 12,853 | 5,028 | 1 | 0 | 130 | 3 |
| 13 | 76.92 | - 837 | 74 | 9,835 | 717 | 1 | 0 | 87 | 2 |
| 14 | 76.96 | - 279 | 76 | 10,245 | 928 | 2 | 0 | 27 | 0 |
| 15 | 77.00 | + 1,395 | 71.9 | 11,204 | 2,000 | 2 | 0 | 21 | 0 |
| 16 | 76.97 | - 1,395 | 72 | 11,045 | 2,000 | 0 | 0 | 26 | 0 |
| 17 | 76.95 | 0 | 74 | 11,844 | 1,458 | 2 | 0 | 35 | 0 |
| 18 | 76.85 | - 1, 395 | 72 | 10,194 | 0 | 4 | 0 | 20 | 1 |
| 19 | 76.88 | 0 | 73 | 8,408 | 604 | 0 | 0 | 27 | 0 |
| 20 | 77.03 | + 2,790 | 74.9 | 18,558 | 7,627 | 0 | 0 | 38 | 0 |
| 21 | 76.20 | -11,160 | 78 | 10,414 | 0 | 0 | 0 | 19 | 0 |
| 22 | 75.28 | -15,540 | 78 | 12,448 | 10,187 | 0 | 0 | 41 | 0 |
| 23 | 75.03 | -10,000 | 78 | 11,088 | 0 | 0 | 0 | 43 | 0 |
| 24 | 74.85 | 0 | 78 | 11,118 | 0 | 13 | 0 | 21 | 2 |
| 25 | 74.85 | 0 | 78 | 10,496 | 0 | 23 | 0 | 41 | 3 |
| 26 | 74.83 | 0 | 78 | 8,304 | 0 | 77 | 2 | 25 | 1 |
| 27 | 75.10 | 0 | 78 | 10,676 | 0 | 75 | 0 | 61 | 0 |
| 28 | 75.00 | + 8,850 | 77 | 9,814 | 0 | 117 | 0 | 88 | 0 |
| 29 | 75.01 | + 139 | 78 | 9,672 | 0 | 173 | 0 | 82 | 0 |
| 30 | 75.07 | + 278 | 78 | 9,631 | 0 | 90 | 0 | 21 | 0 |
| 31 | 75.28 | + 3,475 | 78 | 8,028 | 0 | 87 | 1 | 12 | 0 |
| Aug. | | | | | | | | | |
| 1 | 75.60 | + 5,143 | 78 | 8,185 | 100 | 91 | 0 | 11 | 0 |
| 2 | 75.95 | + 4,170 | 78 | 7,820 | 1,394 | 79 | 0 | 11 | 0 |
| 3 | 76.38 | + 5,996 | 79 | 8,535 | 1 052 | 84 | 0 | 58 | 0 |
| 4 | 76.69 | + 3,194 | 78 | 9,944 | 0 | 98 | 0 | 21 | 0 |
| 5 | 76.78 | + 2,386 | 78 | 9,477 | 0 | 92 | 3 | 13 | 0 |
| 6 | 76.88 | + 1,395 | 76 | 9,926 | 0 | 105 | 1 | 16 | 0 |
| 7 | 76.98 | + 1,395 | 76 | 10,949 | 0 | 149 | 3 | 26 | 0 |
| 8 | 76.85 | - 2,053 | 77 | 10,936 | 0 | 248 | 1 | 2 | 0 |
| 9 | 76.85 | + 837 | 77 | 10,801 | 2,268 | 115 | 0 | 3 | 0 |
| 10 | 76.95 | + 687 | 78.5 | 10,631 | 781 | 86 | 0 | 7 | 0 |
| 11 | 76.98 | - 576 | 77 | 10,493 | 292 | 60 | 1 | 22 | 0 |
| 12 | 77.00 | + 1,284 | 75 | 10,870 | 1,229 | 77 | 2 | 30 | 0 |
| 13 | 76.98 | - 1,395 | 76 | 12,408 | 583 | 96 | 1 | 25 | 0 |
| 14 | 76.83 | - 1,395 | 74 | 11,253 | 0 | 26 | 0 | 13 | 0 |
| 15 | 76.78 | 0 | 74 | 12,075 | 0 | 17 | 0 | 9 | 0 |
| 16 | 76.66 | -2,790 | 73 | 9,383 | 0 | 8 | 0 | 11 | 0 |
| 17 | 76.85 | + 2,790 | 74 | 12,196 | 0 | 11 | 1 | 5 | 0 |
| 18 | 76.49 | -5,457 | 72 | 12,315 | 0 | 14 | 0 | 9 | 0 |

Table 2 continued.

| Date | Reservoir Elevation MSL (+2000) | Reservoir 24-hr net storage change A.F. | Reservoir surface water temp.°F. | Daily mean Brownlee water release | Daily mean Brownlee spillway discharge cfs | Total barge trap catches | | Total downstream migrant facility catches | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Chinook | Steelhead | Chinook | Steelhead |
| Aug | | | | | | | | | |
| 19 | 76.25 | -13,453 | 72.8 | 12,246 | 0 | 6 | 0 | 2 | 0 |
| 20 | 76.20 | 0 | 72 | 10,092 | 0 | 4 | 0 | 5 | 0 |
| 21 | 76.21 | 0 | 72 | 12,226 | 0 | 3 | 0 | 6 | 0 |
| 22 | 76.43 | 0 | 73 | 10,945 | 0 | 2 | 0 | 24 | 0 |
| 23 | 76.75 | +15,000 | 74 | 10,377 | 1,396 | 0 | 0 | 14 | 0 |
| 24 | 77.10 | + 6,700 | 73 | 14,636 | 3,701 | 1 | 0 | 30 | 0 |
| 25 | 76.94 | - 837 | 74 | 14,059 | 2,559 | 2 | 0 | 20 | 0 |
| 26 | 76.92 | + 2,223 | 71.1 | 15,687 | 3,885 | 1 | 0 | 15 | 1 |
| 27 | 76.86 | + 6,985 | 72 | 10,599 | 1,403 | 0 | 0 | 24 | 0 |
| 28 | 76.97 | 0 | 72 | 12,858 | 1,910 | 1 | 0 | 41 | 0 |
| 29 | 76.93 | - 5,580 | 70.4 | 14,378 | 10,736 | 1 | 0 | 0 | 0 |
| 30 | 76.91 | - 2,790 | 70.4 | 15,712 | 11,854 | 4 | 1 | 0 | 0 |
| 31 | 77.00 | 0 | 70.2 | 17,200 | 5,829 | 1 | 0 | 52 | 0 |
| Sept | | | | | | | | | |
| 1 | 76.90 | - 1,395 | 71 | 16,446 | 2,019 | 0 | 0 | 69 | 0 |
| 2 | 76.57 | - 4,603 | 70 | 13,147 | 0 | 1 | 0 | 92 | 0 |
| 3 | 76.27 | - 4,186 | 71 | 14,275 | 0 | 0 | 0 | 51 | 0 |
| 4 | 75.75 | - 7,241 | 70 | 14,086 | 0 | 1 | 0 | 31 | 0 |
| 5 | 75.35 | - 5,560 | 69.1 | 13,568 | 0 | 0 | 0 | 92 | 3 |
| 6 | 75.11 | - 3,336 | 70 | 10,923 | 2,415 | 0 | 0 | 136 | 4 |
| 7 | 75.30 | + 2,641 | 70 | 15,055 | 5,648 | 0 | 0 | 57 | 0 |
| 8 | 75.23 | - 793 | 69 | 13,290 | 993 | 2 | 0 | 36 | 0 |
| 9 | 75.15 | - 1,112 | 70 | 12,930 | 0 | 1 | 0 | 21 | 1 |
| 10 | 75.00 | - 2,085 | 70 | 14,393 | 0 | 0 | 0 | 16 | 0 |
| 11 | 74.92 | - 1,385 | 69.1 | 13,268 | 0 | 0 | 0 | 8 | 0 |
| 12 | 74.89 | - 415 | 70 | 12,998 | 0 | 0 | 0 | 7 | 0 |
| 13 | 74.94 | + 969 | 70 | 9,748 | 0 | 0 | 0 | 60 | 0 |
| 14 | 75.50 | + 7,781 | 70 | 12,291 | 361 | 0 | 0 | 65 | 2 |
| 15 | 76.15 | + 9,043 | 69 | 16,607 | 6,428 | 0 | 0 | 61 | 6 |
| 16 | 76.25 | - 9,845 | 68 | 20,039 | 9,526 | 0 | 0 | 11 | 2 |
| 17 | 76.25 | 0 | 68 | 19,212 | 10,455 | 0 | 0 | 14 | 0 |
| 18 | 75.95 | - 5,000 | 67 | 19,034 | 10,641 | 0 | 0 | 13 | 0 |
| 19 | 75.70 | - 5,000 | 68 | 18,991 | 10,836 | 0 | 0 | 23 | 0 |
| 20 | 75.70 | 0 | 67 | 18,846 | 11,508 | 3 | 0 | 17 | 0 |
| 21 | 75.80 | +14,970 | 67 | 11,308 | 9,034 | 0 | 0 | 10 | 1 |
| 22 | 75.69 | -15,029 | 68 | 19,433 | 8,382 | 2 | 0 | 5 | 0 |
| 23 | 75.42 | -37,051 | 66 | 19,210 | 8,481 | 0 | 0 | 9 | 0 |
| 24 | 74.99 | - 5,979 | 66 | 18,334 | 8,241 | 2 | 0 | 2 | 0 |
| 25 | 74.81 | - 2,493 | 66 | 18,209 | 7,857 | 1 | 0 | 52 | 0 |
| 26 | 74.70 | - 1,524 | 66 | 19,800 | 10,687 | 0 | 0 | 70 | 3 |
| 27 | 74.38 | - 4,428 | 66 | 18,900 | 12,207 | 0 | 0 | 75 | 0 |
| 28 | 74.07 | - 4,294 | 65 | 18,585 | 8,178 | 3 | 0 | 79 | 0 |
| 29 | 73 94 | - 1,801 | 65 | 18,536 | 7,255 | 3 | 0 | 75 | 0 |
| 30 | 74.05 | + 1,653 | 64 | 15,838 | 4,683 | 1 | 0 | 51 | 0 |
| Oct | | | | | | | | | |
| 1 | 74.25 | + 2,635 | 62 | 15,213 | 4,124 | 0 | 0 | 31 | 0 |
| 2 | 74.45 | + 2.663 | 60 | 15,361 | 4,110 | 0 | 0 | 8 | 0 |
| 3 | 74.60 | + 2,078 | 64 | 15,496 | 5,684 | 4 | 0 | 18 | 0 |
| 4 | 74.70 | + 10385 | 64 | 15,519 | 7,068 | 2 | 0 | 27 | 0 |
| 5 | 74.85 | + 2,077 | 63 | 15,893 | 5,950 | 3 | 0 | 23 | 0 |

Table 2 continued.

| Date | Reservoir Elevation MSL(+2000) | Reservoir 24-hr net storage change A.F | Reservoir surface water temp°F. | Daily mean Brownlee water release | Daily mean Brownlee spillway discharge cfs | Total barge Trap catches Chinook | Steelhead | Total downstream Migrant facility catches Chinook | Steelhead |
|---|---|---|---|---|---|---|---|---|---|
| Oct | | | | | | | | | |
| 6 | 74.82 | - 415 | 63 | 15,860 | 7,141 | 3 | 0 | 27 | 0 |
| 7 | 75.07 | + 3,466 | 62 | 15,856 | 5,160 | 9 | 0 | 48 | 0 |
| 8 | 74.94 | - 1,804 | 61 | 16,594 | 5,553 | 3 | 0 | 45 | 0 |
| 9 | 74.92 | - 277 | 60 | 17,514 | 7,501 | 3 | 0 | 66 | 0 |
| 10 | 74.78 | - 2,077 | 61 | 18,041 | 9,395 | 3 | 0 | 17 | 1 |
| 11 | 74.77 | 0 | 61 | 17,997 | 12,300 | 1 | 0 | 33 | 0 |
| 12 | 74.86 | + 1,246 | 60 | 18,783 | 11,010 | 3 | 0 | 23 | 0 |
| 13 | 74.87 | + 139 | 62 | 18,786 | 10,551 | 0 | | . 28 | 0 |
| 14 | 74.75 | - 1,663 | 62 | 18,785 | 11,307 | n.c. | n.c. | 23 | 0 |
| 15 | 74.70 | - 689 | 62 | 18,848 | 12,031 | n.c. | n.c. | 20 | 0 |
| 16 | 74.06 | - 7,845 | 62 | 18,849 | 11,955 | 190 | 5 | 2 | 0 |
| 17 | 73.75 | - 5,300 | 61 | 18,822 | 11,608 | 15 | 1 | 1 | 0 |
| 18 | 73.40 | - 4,830 | 61 | 18,836 | 12,129 | 7 | 0 | 2 | 0 |
| 19 | 72.99 | - 5,520 | 60 | 18,435 | 11,512 | 25 | 1 | 0 | 0 |
| 20 | 72.68 | - 4,400 | 60 | 18,797 | 11,881 | 17 | 0 | 0 | 0 |
| 21 | 72.14 | - 7,430 | 60 | 18,760 | 10,619 | 24 | 0 | 7 | 0 |
| 22 | 71.75 | - 5,345 | 59 | 18,736 | 10,833 | 63 | 1 | 0 | 0 |
| 23 | 71.33 | - 5,755 | 58 | 18,865 | 10,974 | 44 | 1 | 15 | 0 |
| 24 | 70.94 | - 4,710 | 57 | 18,780 | 11,615 | 7 | 0 | 10 | 0 |
| 25 | 70.68 | - 4,160 | 58 | 18,814 | 11,788 | 12 | 0 | 11 | 0 |
| 26 | 70.23 | - 6,120 | 58.2 | 18,133 | 9,495 | 30 | 0 | 0 | 0 |
| 27 | 69.88 | - 4,756 | 58 | 16,775 | 8,633 | 25 | 0 | 0 | 0 |
| 28 | 69.34 | - 5,946 | 58 | 18,853 | 10,001 | 37 | 1 | 54 | 0 |
| 29 | 68.58 | -11,648 | 59 | 16,064 | 1,465 | 28 | 0 | 32 | 0 |
| 30 | 68.55 | - 425 | 59 | 11,329 | 2,686 | 27 | 1 | 11 | 0 |
| 31 | 68.68 | + 1,775 | 59 | 14,542 | 6,785 | 17 | 0 | 4 | 0 |
| Nov | | | | | | | | | |
| 1 | 68.67 | - 135 | 60 | 15,681 | 8,193 | 21 | 0 | 11 | 0 |
| 2 | 68.61 | - 810 | 58 | 15,194 | 5,540 | n.c. | n.c. | 17 | 0 |
| 3 | 68.61 | - 540 | 57 | 15,746 | 5,703 | n.c. | n.c. | 20 | 0 |
| 4 | 68.45 | - 2,025 | 57 | 15,860 | 5,546 | 38 | 0 | 15 | 0 |
| 5 | 68.20 | - 2,970 | 56 | 13,751 | 1,864 | 10 | 0 | 8 | 0 |
| 6 | 68.30 | + 1,350 | 56 | 12,659 | 771 | 7 | 0 | 10 | 0 |
| 7 | 68.60 | + 4,050 | 56 | 11,890 | 915 | 4 | 0 | 76 | 0 |
| 8 | 68.85 | + 3,375 | 55 | 12,889 | 3,132 | 0 | 0 | 38 | 0 |
| 9 | 69.02 | + 2,296 | 54 | 13,925 | 3,966 | 14 | 0 | 16 | 0 |
| 10 | 69.00 | - 271 | 54 | 13,354 | 3,448 | 9 | 0 | 17 | 0 |
| 11 | 69.05 | 0 | 54 | 14,921 | 4,562 | 4 | 0 | 11 | 0 |
| 12 | 69.02 | 0 | 53 | 12,888 | 1,768 | 10 | 0 | 0 | 0 |
| 13 | 68.84 | - 1,350 | - - | 13,645 | 1,729 | 4 | 0 | 8 | 0 |
| 14 | 68.84 | - 1,350 | 52 | 13,396 | 1,306 | 4 | 0 | 11 | 0 |
| 15 | 68.85 | 0 | 54 | 12,526 | 0 | 1 | 0 | 16 | 0 |
| 16 | 68.75 | - 675 | 54 | 14,568 | 125 | 0 | 0 | 0 | 0 |
| 17 | 68.51 | - 3,240 | 54 | 13,960 | 0 | 1 | 0 | 6 | 0 |
| 18 | 68.34 | - 2,835 | 54 | 14,412 | 0 | 1 | 0 | 0 | 0 |
| 19 | 68.05 | - 4,390 | 53 | 13, 883 | 0 | 0 | 0 | 0 | 0 |
| 20 | 68.00 | 0 | 52 | 12,957 | 275 | 1 | 0 | 15 | 0 |
| 21 | 68.04 | + 540 | 53 | 11,292 | 767 | 2 | 1 | 0 | 0 |
| 22 | 68.29 | + 3,375 | 52 | 11,136 | 1,119 | 4 | 0 | 44 | 0 |
| 23 | 68.63 | + 4,570 | 51 | 12,328 | 1,051 | 2 | 0 | 34 | 0 |

Table 2 continued.

| Date | Reservoir Elevation MSL(+2000) | Reservoir 24-hr net storage change A.F | Reservoir surface water temp°F. | Daily mean Brownlee water release | Daily mean Brownlee spillway discharge cfs | Total barge Trap catches | | Total downstream Migrant facility catches | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Chinook | Steelhead | Chinook | Steelhead |
| Nov | | | | | | | | | |
| 24 | 68.90 | + 3,645 | 51 | 12,373 | 693 | 1 | 0 | 0 | 0 |
| 25 | 69.25 | + 4,738 | 53 | 13,162 | 1,349 | 5 | 0 | 56 | 0 |
| 26 | 69.39 | + 1,896 | 52 | 15,451 | 6,098 | n.c. | n.c. | 0 | 0 |
| 27 | 69.20 | - 2,574 | 52 | 16,287 | 6,013 | 9 | 0 | 0 | 0 |
| 28 | 68.82 | - 5,950 | 52 | 17,928 | 7,595 | n.c. | n.c. | 28 | 0 |
| 29 | 68.26 | - 6,750 | 52 | 18,154 | 8,263 | 12 | 0 | 0 | 0 |
| 30 | 67.68 | - 7,814 | 46 | 17,710 | 4,564 | 6 | 0 | 9 | 0 |

* All data except bare trap catches from Idaho Power Company.

n.c. Traps not checked

Table 3, Computations of estimated numbers o£ chinook salmon and steelhead trout passing barge trapping site, July 15-August 26 and October 1-November 12, 1959

| Date | Barge trap floes cfs #1 | 2 | #3 | Total trap flows, cfs | Mean daily release at Brownlee., cfs | Factor | Estimated total number Chinook | Steelhead |
|---|---|---|---|---|---|---|---|---|
| July | | | | | | | | |
| 15 | 150 | 120 | 130 | 420 | 11,204 | 27 | 54 | |
| 16 | 120 | 120 | 120 | 360 | 11,045 | 31 | | |
| 17 | 180 | 210 | 120 | 510 | 11,844 | 23 | 46 | |
| 18 | 180 | 168 | 144 | 492 | 10,194 | 21 | 84 | |
| 19 | 180 | 168 | 180 | 428 | 8,408 | 20 | | |
| 20 | 288 | 216 | 252 | 756 | 18,558 | 25 | | |
| 21 | 180 | | | 180 | 10,414 | 58 | | |
| 22 | | | | | 12,448 | | | |
| 23 | | | | | 11,088 | | | |
| 24 | | 168 | 150 | 318 | 11,118 | 35 | 455 | |
| 25 | | 168 | 252 | 420 | 10,496 | 25 | 575 | |
| 26 | | 210 | 180 | 390 | 8,344 | 21 | 1,617 | 42 |
| 27 | | 252 | 180 | 432 | 10,676 | 25 | 1,875 | |
| 28 | | 216 | 144 | 360 | 9,814 | 27 | 3,159 | |
| 29 | | 210 | 180 | 390 | 9,672 | 25 | 4,325 | |
| 30 | | 168 | 150 | 318 | 9,631 | 30 | 2,700 | |
| 31 | | 168 | 180 | 348 | 8,028 | 24 | 2,001 | 23 |
| Aug | | | | | | | | |
| 1 | | 180 | 180 | 360 | 8,185 | 23 | 2,093 | |
| 2 | | 210 | 180 | 390 | 7,820 | 20 | 1,580 | |
| 3 | | 30 | 210 | 240 | 8,535 | 36 | 3,024 | |
| 4 | | 42 | 180 | 222 | 9,944 | 45 | 4,410 | |
| 5 | | 42 | 216 | 258 | 9,477 | 37 | 3,404 | 111 |
| 6 | | 42 | 252 | 294 | 9,926 | 34 | 3,570 | |
| 7 | | 36 | 162 | 198 | 10,949 | 55 | 8,195 | 165 |
| 8 | | 42 | 168 | 210 | 10,936 | 52 | 12,896 | 52 |
| 9 | | 42 | 144 | 186 | 10,801 | 58 | 6,670 | |
| 10 | | 42 | 180 | 222 | 10,631 | 48 | 4,128 | |
| 11 | | 36 | 180 | 216 | 10,493 | 49 | 2,940 | 49 |
| 12 | | 144 | 180 | 324 | 10,870 | 34 | 2,618 | 68 |
| 13 | | 144 | 180 | 324 | 12,408 | 38 | 3,648 | 38 |
| 14 | | 180 | | 180 | 11,253 | 63 | 1,638 | |
| 15 | | 144 | | 144 | 12, 075 | 84 | 1,428 | |
| 16 | | 180 | | 180 | 9,383 | 52 | 416 | |
| 17 | | 180 | | 180 | 12,196 | 68 | 748 | 68 |
| 18 | | 180 | | 180 | 12,315 | 68 | 952 | |
| 19 | | 210 | | 210 | 12,246 | 58 | 348 | |
| 20 | | 252 | 216 | 468 | 11,092 | 24 | 96 | |
| 21 | | 210 | 216 | 426 | 12,226 | 29 | 87 | |
| 22 | | 210 | 252 | 462 | 12,945 | 28 | 56 | |
| 23 | | 168 | 210 | 378 | 10,377 | 27 | 0 | |
| 24 | | 210 | 210 | 420 | 14,636 | 35 | 35 | |
| 25 | | 168 | 252 | 420 | 14,059 | 33 | 66 | |
| 26 | | 168 | 210 | 378 | 15,687 | 42 | 42 | |
| | | | | | | | 81,979 | 616 |

out of operation until August 28

Table 3, continued.

| Date | Barge trap floes cfs #1 | 2 | #3 | Total trap flows, cfs | Mean daily release at Brownlee., cfs | Factor | Estimated total number Chinook | Steelhead |
|---|---|---|---|---|---|---|---|---|
| Oct | | | | | | | | |
| 1 | 127.2 | 146.4 | 105.6 | 379.2 | 15,213 | 40 | | |
| 2 | 127.2 | 156 | 110.4 | 393.6 | 15,361 | 39 | | |
| 3 | 129.6 | 158.4 | 112.8 | 400.8 | 15,496 | 39 | 156 | |
| 4 | 127.2 | 156 | 110.4 | 393.6 | 15,519 | 39 | 78 | |
| 5 | 127.2 | 144 | 112.8 | 384 | 15,893 | 41 | 123 | |
| 6 | 97.2 | 109.8 | 81 | 288 | 15,860 | 55 | 165 | |
| 7 | 99 | 126 | 86.4 | 311.4 | 15,856 | 51 | 459 | |
| 8 | 95.4 | 117 | 81 | 293.4 | 15,594 | 53 | 159 | |
| 9 | 95.4 | 115.2 | 79.2 | 289.8 | 17,514 | 60 | 180 | |
| 10 | 97.2 | 115.2 | 79.2 | 291.6 | 18,041 | 62 | 186 | |
| 11 | 97.2 | 117 | 79.2 | 293.4 | 17,997 | 61 | 61 | |
| 12 | 99 | 118.8 | 77.4 | 295.2 | 18,783 | 64 | 192 | |
| 13 | 97.2 | 117 | 79.2 | 293.4 | 18,786 | 64 | | |
| 14 | No checks engine out of order | | | | 18,785 | | | |
| 15 | No checks engine out of order | | | | 18,848 | | | |
| 16 | 99 | | 79.2 | 297 | 18,849 | 63 | 11,970 | 378 |
| 17 | 97.2 | | 99 | 196.2 | 18,822 | 96 | 1,440 | |
| 18 | 97.2 | | 99 | 196.2 | 18,836 | 96 | 672 | |
| 19 | 99 | | 81 | 180 | 18,835 | 105 | 2,625 | 105 |
| 20 | 97.2 | | 81 | 178.2 | 18,797 | 105 | 1,785 | |
| 21 | 99 | | 91.8 | 190.8 | 18,760 | 98 | 2,352 | |
| 22 | 95.4 | | 88.2 | 183.6 | 18,736 | 102 | 6,426 | 102 |
| 23 | 97.2 | | 90 | 187.2 | 18,865 | 101 | 4,444 | 101 |
| 24 | 97.2 | | 91.8 | 189 | 18,780 | 99 | 5,643 | |
| 25 | 99 | | 91.8 | 190.8 | 18,814 | 99 | 1,188 | |
| 26 | 102.6 | | 91.8 | 194.4 | 18,133 | 93 | 2,790 | |
| 27 | 102.6 | | 93.6 | 196.2 | 16,775 | 85 | 2,125 | |
| 28 | 104.4 | | 93.6 | 198 | 18,853 | 95 | 3,515 | 95 |
| 29 | 104.4 | | 90 | 194.4 | 16,064 | 83 | 2,324 | |
| 3o | 100.8 | | 90 | 190.8 | 11,329 | 59 | 1,593 | 59 |
| 31 | 99 | | 90 | 189 | 14,542 | 77 | 1,309 | |
| Nov | | | | | | | | |
| 1 | 100.8 | | 91.8 | 192.6 | 15,.681 | 81 | 1,701 | |
| 2 | No the ks boat motor gone | | | | 15,194 | | | |
| 3 | No the ks boat motor gone | | | | 15,746 | | | |
| 4 | 102.6 | | 93.6 | 196.2 | 15,860 | 81 | 3,078 | |
| 5 | 102.6 | | 90 | 192.6 | 13,751 | 71 | 710 | |
| 6 | 99 | | 86.4 | 185.4 | 12,659 | 68 | 476 | |
| 7 | 102.6 | | 90 | 192.6 | 11,890 | 62 | 248 | |
| 8 | 100.8 | | 90 | 190.8 | 12,889 | 68 | 68 | |
| 9 | 136.8 | | 115.2 | 252 | 13,925 | 55 | 770 | |
| 10 | 134.4 | | 115.2 | 249.6 | 13,354 | 54 | 486 | |
| 11 | 136.8 | 144 | 120 | 400.8 | 14,921 | 37 | 148 | |
| 12 | 136.8 | 144 | 122.4 | 403.2 | 12,888 | 32 | 320 | |
| | | | | | | | 61,965 | 840 |

out of operation until Nov. 11

Table 4. Hourly spill and total by-pass at Brownlee Dam on July 20 and July 22, 1960.

| Time | July 20 Spill in c.f.s, | July 20 Total by-pass c.f.s. | July 22 Spill in c.f.s. | July 22 Total by pass c.f.s. |
|---|---|---|---|---|
| 1 A.M. | 2,000 | 11,045 | --- | 9,620 |
| 2 A.M. | 2,000 | 11,060 | 22,365 | 31,425 |
| 3 A.M. | 2,000 | 10,920 | 29,886 | 38,716 |
| 4 A.M. | 2,000 | 9,955 | 30,142 | 38,882 |
| 5 A.M. | 2,000 | 9,745 | 33,446 | 41,596 |
| 6 A.M. | 2,000 | 10,140 | 30,155 | 38,895 |
| 7 A.M. | 2,000 | 11,150 | 26,147 | 35,497 |
| 8 A.M. | 500 | 11,075 | 10,250 | 21,165 |
| 9 A.M. | --- | 11,110 | 15,570 | 26,665 |
| 10 A.M. | --- | 10,690 | 16,000 | 27,885 |
| 11 A.M. | 1,067 | 13,227 | 20,820 | 33,235 |
| 12 Noon | 21,500 | 35,920 | 9,710 | 21,700 |
| 1 P.M. | 28,000 | 42,450 | --- | 9,575 |
| 2 P.M. | 25,900 | 40,305 | --- | 6,125 |
| 3 P.M. | 6,305 | 19,685 | --- | 7,130 |
| 4 P.M. | 8,000 | 19,755 | --- | 9,540 |
| 5 P.M. | 9,000 | 19,380 | --- | 11,570 |
| 6 P.M. | 28,000 | 36,605 | --- | 11,605 |
| 7 P.M. | 17,400 | 26,320 | --- | 12,790 |
| 8 P.M. | 12,100 | 21,380 | --- | 12,410 |
| 9 P.M. | 9,870 | 21,350 | --- | 14,085 |
| 10 P.M. | 1,400 | 15,635 | --- | 13,780 |
| 11 P.M. | --- | 13,775 | --- | 13,045 |
| 12 Mid. | --- | 12,180 | --- | 11,280 |

occurred when the surface temperatures of the reservoir ranged from 53 up to 70 degrees F. (Table 2).

Only small numbers of downstream migrants passed through or under the barrier net the last part of August or the first part of September despite the fact that large water releases were made. Possibly there were no concentrations of chinook salmon in the vicinity of the net and dam at this time.

The second period of high catches in 1959 occurred between October 1 and November 12 when an estimated 61,965 chinook salmon passed by the trapping barges below Brownlee Dam. A large hole in the Idaho shore-wing net was discovered soon after the beginning of this second large surge of downstream migrants. The heavy water releases at Brownlee in late August and in September and October probably attracted large numbers of chinook salmon fingerlings from the upper reaches of the reservoir.

Assuming the barge traps were catching a representative sample of migrants, that is migrants were evenly distributed through the river cross-sectional. areas, the estimated total of downstream chinook migrants passing by the trapping site from July 15 to August 26 and October 1 to November 12 was 143,944, as evidenced by the barge trap catches.

Approximately 78.4 per cent of the downstream migrating chinook salmon caught in the trapping barges from July 1 to November 15, 1959, were dead at the time of examination. Some of the fish unquestionably died after entering the traps, therefore the mortality rates shown must be considered maximum. The per cents of chinooks for the respective months which were dead upon examination were as follows: July--74.0, August--83.4, September--95.0, October--74.8 and November --63.2. Nearly all of the dead fish examined showed some evidence of subjection to pressure changes--bulging eyes; broken air bladder; bleeding at the gills, mouth and anus; or the protrusion of viscera, through anus.

Fork-length frequencies of downstream migrating chinook

Table 5 shows the fork-length frequencies of 2,340 chinook salmon downstream migrants caught on the trapping barges from April 1, 1959, to December 318 1959. A mean monthly growth increment of approximately 16.2 mm. was exhibited by chinook salmon, most of which were fall chinook.

It was apparent that some of the fry caught in April and May, 1959, were offspring of fish that had spawned below Brownlee Dam and a short distance above the trapping site.

Steelhead trout downstream migrants

Catches of steelhead trout downstream migrants were relatively light during the two periods of heavy chinook salmon catches. This is probably due to the fact that the bulk of the steelhead migrants leaving the reservoir had already passed through prior to these periods; those remaining had lost their migratory instinct. Total estimated numbers of steelhead caught from July 15 to August 26 were 616 fish and from October 1 to November 12, 840 fish (Table 3).

Approximately 78.6 per cent of the steelhead caught from July 1 to November 15, 1959, were dead. Most of these exhibited the same symptoms of pressure changes as the chinook. Daily, monthly and total mortality rates for chinook salmon and steelhead trout catches are given in Table 6. The two species are combined inasmuch as the total mortality rates were almost identical.

Fork-length frequencies of downstream migrating steelhead trout.

Steelhead caught ranged in fork length from 175 to 238 mm. Sufficient numbers were not obtained to present fork-length frequency data.

Seagull activity

Large concentrations of seagulls were present below the dam daily during the two periods of heavy salmon catches mentioned. These gulls were observed to be feeding on dead and live fish--presumably salmon or steelhead. Heaviest concentrations of feeding gulls were in the powerhouse tailrace and below the spillway.

Table 5. Fork-length frequency of 2,340 chinook salmon downstream migrants caught from April 1, 1959, to December 31, 1959 on downstream migrant trapping barges blow Brownlee Dam.

| Length in mm. | Apr. | May | June | July* | Aug. | Sept. | Oct. | Nov. | Dec. |
|---|---|---|---|---|---|---|---|---|---|
| 20-24 | 1 | | | | | | | | |
| 25-29 | 3 | 1 | | | | | | | |
| 30-34 | 15 | 5 | | | | | | | |
| 35-39 | 24 | 6 | | | | | | | |
| 40-44 | 2 | 1 | | | | | | | |
| 45-49 | 4 | | | | | | | | |
| 50-54 | 3 | | | | | | | | |
| 55-59 | | | | | | | | | |
| 60-64 | | 1 | | | | | | | |
| 65-69 | | 2 | 1 | | | | | | |
| 70-74 | 1 | 2 | 2 | | | | | | |
| 75-79 | | 6 | 1 | | | | | | |
| 80-84 | | 6 | 2 | | | | | | |
| 85-89 | | 19 | 6 | | | | | | |
| 90-94 | 1 | 8 | 9 | | | | | | |
| 95-99 | | 4 | 7 | | | | | | |
| 100-104 | | 1 | 11 | | | | | | |
| 105-109 | | | 17 | | 1 | | | | |
| 110-114 | | | 37 | | | | | | |
| 115-119 | | 1 | 91 | 3 | | | | | |
| 120-124 | | 1 | 74 | 12 | 1 | | | | |
| 125-129 | 2 | 1 | 51 | 43 | 29 | 1 | | | |
| 130-134 | | 1 | 14 | 147 | 133 | | | | |
| 135-139 | | | 8 | 246 | 188 | 2 | | | |
| 140-144 | | | 1 | 177 | 142 | 2 | | | |
| 145-149 | | | | 67 | 49 | 3 | 3 | | |
| 150-154 | | | 1 | 5 | 9 | 7 | 6 | | |
| 155-159 | | | | 2 | 1 | 1 | 6 | | |
| 160-164 | | | | | | 1 | 39 | 2 | |
| 165-169 | | | | | | 2 | 76 | 11 | |
| 170-174 | | | 1 | | | 1 | 151 | 17 | |
| 175-179 | | | | | | | 115 | 31 | 7 |
| 180-184 | | | 1 | | | | 53 | 28 | 12 |
| 185-189 | | | | | | | 2 | 12 | 5 |
| 190-194 | | | 1 | | | | | 12 | 6 |
| 195-199 | | | | | | | 2 | 5 | |
| 200-204 | | | | | 1 | | 1 | 3 | 1 |
| 205-209 | | | | | | | | 1 | |
| $\bar{x}$ = | 41.9 | 71.1 | 118.1 | 138.0 | 138.1 | 151.3 | 172.9 | 180.9 | 184.8 |
| n = | 56 | 66 | 336 | 702 | 533 | 20 | 454 | 122 | 31 |

* Approximately 93% of the July catch was made between July 24 and July 31.

Table 6. Daily, monthly and total mortality rates for combined chinook salmon and steelhead trout barge trap catches, July 15 - November 15, 1959.

| July | Number Caught | Number Dead | Per cent Dead | Aug. | Number Caught | Number Dead | Per Cent Dead |
|---|---|---|---|---|---|---|---|
| 1 | | | | 1 | 91 | 41 | 45.05 |
| 2 | | | | 2 | 79 | 75 | 94.94 |
| 3 | | | | 3 | 84 | 65 | 77.38 |
| 4 | | | | 4 | 98 | 48 | 48.98 |
| 5 | | | | 5 | 95 | 82 | 86.32 |
| 6 | | | | 6 | 106 | 93 | 87.74 |
| 7 | | | | 7 | 152 | 145 | 95.39 |
| 8 | | | | 8 | 249 | 242 | 97.19 |
| 9 | | | | 9 | 115 | 112 | 97.39 |
| 10 | | | | 10 | 86 | 58 | 67.44 |
| 11 | | | | 11 | 61 | 35 | 57.38 |
| 12 | | | | 12 | 79 | 66 | 83.54 |
| 13 | | | | 13 | 97 | 96 | 98.97 |
| 14 | | | | 14 | 26 | 26 | 100.00 |
| 15 | 2 | | | 15 | 17 | 13 | 76.47 |
| 16 | | | | 16 | 8 | 7 | 87.50 |
| 17 | 2 | | | 17 | 12 | 11 | 91.66 |
| 18 | 4 | 2 | 50.00 | 18 | 14 | 11 | 78.57 |
| 19 | | | | 19 | 6 | 5 | 83.33 |
| 20 | | | | 20 | 4 | 1 | 25.00 |
| 21 | | | | 21 | 3 | 2 | 66.66 |
| 22 | | | | 22 | 2 | 2 | 50.00 |
| 23 | | | | 23 | | | |
| 24 | 13 | 6 | 46.15 | 24 | 1 | 1 | 100.00 |
| 25 | 23 | 9 | 39.13 | 25 | 2 | 2 | 100.00 |
| 26 | 79 | 54 | 68.35 | 26 | 1 | 1 | 100.00 |
| 27 | 75 | 67 | 89.33 | 27 | | | |
| 28 | 117 | 101 | 86.32 | 28 | 1 | | |
| 29 | 173 | 128 | 73.99 | 29 | 1 | 1 | 100.00 |
| 30 | 90 | 57 | 63.33 | 30 | 5 | 5 | 100.00 |
| 31 | 88 | 69 | 78.41 | 31 | 1 | 1 | 100.00 |
| Total | 666 | 493 | 74.02 | | 1,496 | 1,247 | 83.36 |

| Sept. | | | | Oct. | | | |
|---|---|---|---|---|---|---|---|
| 1 | | | | 1 | | | |
| 2 | 1 | 1 | 100.00 | 2 | | | |
| 3 | | | | 3 | 4 | 2 | 50.00 |
| 4 | 1 | | | 4 | 2 | 2 | 100.00 |
| 5 | | | | 5 | 3 | 3 | 100.00 |
| 6 | | | | 6 | 3 | | |
| 7 | | | | 7 | 9 | 7 | 77.77 |
| 8 | 2 | 2 | 100.00 | 8 | 3 | 3 | 100.00 |
| 9 | 1 | 1 | 100.00 | 9 | 3 | 3 | 100.00 |
| 10 | | | | 10 | 3 | 3 | 100.00 |
| 11 | | | | 11 | 1 | 1 | 100.00 |
| 12 | | | | 12 | 3 | 3 | 100.00 |
| 13 | | | | 13 | | | |
| 14 | | | | 14 | n.c. | | |
| 15 | | | | 15 | n,c. | | |
| 16 | | | | 16 | 196 | 182 | 92.86 |

| (cont.) Sept. | Number Caught | Number Dead | Per cent Dead | (cont.) Oct. | Number Caught | Number Dead | Per cent Dead |
|---|---|---|---|---|---|---|---|
| 17 | | | | 17 | 15 | 11 | 73.33 |
| 18 | | | | 18 | 7 | 5 | 71.43 |
| 19 | | | | 19 | 26 | 11 | 42.31 |
| 20 | 3 | 3 | 100.00 | 20 | 17 | 11 | 64.71 |
| 21 | | | | 21 | 24 | 16 | 66.66 |
| 22 | 2 | 2 | 100.00 | 22 | 64 | 40 | 62.50 |
| 23 | | | | 23 | 45 | 33 | 73.33 |
| 24 | 2 | 2 | 100.00 | 24 | 57 | 43 | 75.44 |
| 25 | 1 | 1 | 100.00 | 25 | 12 | 8 | 66.66 |
| 26 | | | | 26 | 30 | 22 | 73.33 |
| 27 | | | | 27 | 25 | 13 | 52.00 |
| 28 | 3 | 3 | | 28 | 38 | 31 | 81.58 |
| 29 | 3 | 3 | | 29 | 28 | 19 | 67.86 |
| 30 | 1 | 1 | | 30 | 28 | 14 | 50.00 |
| 31 | | | | 31 | 17 | 10 | 58.82 |
| Total | 20 | 19 | 95.00 | | 663 | 496 | 74.81 |
| Nov. | | | | | | | |
| 1 | 21 | 13 | 61.90 | | | | |
| 2 | n.c. | | | | | | |
| 3 | n.c. | | | | | | |
| 4 | 38 | 34 | 89.47 | | | | |
| 5 | 10 | 6 | 60 00 | | | | |
| 6 | 7 | 4 | 57.14 | | | | |
| 7 | 4 | 3 | 75.00 | | | | |
| 8 | | | | | | | |
| 9 | 14 | 9 | 64.29 | | | | |
| 10 | 9 | 9 | 100.00 | | | | |
| 11 | 4 | 2 | 50.00 | | | | |
| 12 | 10 | 3 | 33.33 | | | | |
| 13 | 4 | 3 | 75.00 | | | | |
| 14 | 4 | | | | | | |
| 15 | 1 | | | | | | |
| 16 | | | | | | | |
| 17 | 1 | 1 | 100.00 | | | | |
| 18 | 1 | | | | | | |
| 19 | | | | | | | |
| 20 | 1 | 1 | 100.00 | | | | |
| 21 | 3 | | | | | | |
| 22 | 4 | 1 | 25.00 | | | | |
| 23 | 2 | 2 | 100.00 | | | | |
| 24 | 1 | | | | | | |
| 25 | 5 | 3 | 60.00 | | | | |
| 26 | n.c. | | | | | | |
| 27 | 9 | 4 | 44.44 | | | | |
| 28 | n.c. | | | | | | |
| 29 | 12 | 7 | 58.33 | | | | |
| 30 | 6 | 3 | 50.00 | | | | |
| Total | 171 | 108 | 63.16 | n.c. | no check | | |
| Grand Totals | 3,016 | 2,363 | 78.35 | | | | |

Of 28 gulls examined, 27 had salmon in their stomachs; 26 of the gulls had one identifiable salmon in their stomachs and one gull had two identifiable salmon in it. Gulls were of two species; glaucus-winged (Larus glaucescens) and herring (Larus argentatus).

## Summary and Discussion

There are two periods in 1959 when large catches of chinook salmon downstream migrants were made below Brownlee Dam and its downstream migrant facilities. The first occurred between July 15 and August 26 when an estimated 81,979 chinook passed the barrier net and the trapping site below the dam. The second occurred between October 1 and November 12 when an estimated 61,965 chinook salmon passed.

The first large surge of fish can probably be attributed to the rapid releases of large quantities of water from the reservoir and the subsequent displacement of cool waters just above the dam with warmer surface waters. Water temperatures in the upper strata of the reservoir increased apparently causing the chinook salmon to sound under or pass through lower, damaged parts of the net.

A large hole in the Idaho shore-wing net together with large reservoir drawdown could explain the second large movement of salmon out of the reservoir during October and November.

The estimates of the total fish passing the barge traps are probably low for several reasons. Some of the larger fish can escape the traps by swimming back out. Many of the chinook, presumably dead, were eaten by gulls before the fish passed by the trapping site. A large number of the dead fish probably rolled along the bottom of the river and became lodged on rocks and debris and consequently never reached the trapping sites. Since the traps fish only the surface waters, the estimates are probably low for both dead and live fish.

Monthly mean fork-length frequencies of fall chinook salmon downstream migrants increased from 41.9 mm. in April to 184.8 mm. in December of 1959.

Steelhead trout migrations were relatively light during the two surges of chinook. An estimated 616 passed the trapping site in the first surge and 777 in the second surge.

Gulls in large concentrations below the dam were observed feeding on fish presumed to be salmon or steelhead. Of 28 gull stomachs examined, 27 contained salmon.